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SEMIANNUAL TECHNICAL REPORT FOR RESEARCH GRANT FOR 1 JAN 93 TO 30 JUN 93

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Grant Title:

Exploitation of Cyclostationarity for

Signal-Parameter Estimation and System

Identification

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PROGRESS

There are three particularly notable accomplishments during the present reporting period. The first is the development of a substantial generalization of our SCORE algorithm for blind adaptive spatial filtering to the Programmable Canonical Correlation Analyzer (PCCA) which can exploit any of a number of signal properties to distinguish between signals of interest (to be beamformed on) and signals not of interest (to be nulled out). The second is a new algorithm for blind adaptive channel equalization for PAM and digital QAM signals, and for either single or multiple channels. These two developments are briefly described in [2] and a particularly attractive special case of the blind equalization algorithm for single channels is briefly described in [1]. The substantial performance improvements (acceleration of convergence) attainable with multicycle SCORE, which is one example of PCCA, are described in [3]. The substantial performance improvements (lower BER and lower admissible input SNR) of our blind channel equalizer relative to Tong, Xu, and Kailath's equalizer are described in [2].

The third notable achievement is the completion of the edited volume Cyclostationarity in Communications and Signal Processing, [4] being published by IEEE Press this Fall. A table of contents of this volume is enclosed.

In addition, we have continued our work, from earlier periods of support under this contract, on the application of blind adaptive spatio-temporal filtering to mobile cellular radio. We have proposed and simulated a new system concept that provides more capacity than any of its competitors [5]. We shall continue to evaluate this new system design while seeking refinements to further improve performance and/or reduce complexity.

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PAPERS AND CHAPTERS PUBLISHED OR IN PRESS, OR SUBMITTED

- 1. W. A. Gardner, "An Introduction to Cyclostationary Signals," Chapter 1 in Cyclostationarity in Communications and Signal Processing, IEEE Press, 1993. (in press)
- 2. S. V. Schell, "An Overview of Sensor Array Processing for Cyclostationary Signals," Chapter 3 in Cyclostationarity in Communications and Signal Processing, IEEE Press, 1993. (in press)
- S. V. Schell and W. A. Gardner, "Maximum-likelihood and common factor analysis-based blind adaptive spatial filtering for cyclostationary signals," <u>Proceedings of 1993 IEEE</u> <u>International Conference on Acoustics. Speech and Signal Processing</u>, pp. IV-292 - IV-295. (published)
- 4. W. A. Gardner, ed., Cyclostationarity in Communications and Signal Processing, IEEE Press, 1993. (in press)
- 5. S. V. Schell and W. A. Gardner, "Blind adaptive antenna arrays in cellular communications for increased capacity," <u>Proceedings Third Virginia Tech. Symp. on Wireless Personal Communications</u>, Kluwer Academic Publisher. (in press)
- 6. S. V. Schell and W. A. Gardner, "Programmable common term analysis: A unifying framework for blind adaptive spatial filtering," Twenty-Seventh Annual Asilomar Conference on Signals, Systems and Computers, November 1-3, 1993. (submitted)